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## Road marking paint standards

Any kind of device or material used on a road surface to convey official information Examples and perspective in this article mainly cover the English-speaking world and do not represent a global picture of the subject. You improve this article, discuss the issue on the conversation page or create a new article, as the case is. (April 2011) (Learn how and when to delete this template message) Variety of road surface markings Road marking machine operating in Kenya[1] Road marking machine operating in Bahrain, December 2012[2] The road surface marking is any kind of device or material used on a road surface to convey official information; they are often placed with road marking machines (or road marking equipment, pavement marking equipment). They can also be used in other facilities used by vehicles to mark parking spaces or designate areas for other purposes. Road surface markings are used on paved roads to provide guidance and information to drivers and pedestrians. Uniformity of markings is an important factor in minimizing confusion and uncertainty about their significance, and efforts are being made to standardise such markings across borders. However, countries and territories categorize and specify markings on the road surface in different ways: white lines are called white lines mechanically, not mechanically or temporarily. They can be used to delineate lanes, inform motorists and pedestrians or serve as sound generators when walking on a road, or try to wake a sleeping driver when installed in the shoulders of a road. The marking of the road surface may also indicate regulation for parking and stopping. Work is ongoing to improve the road marking system, and technological breakthroughs include adding retroreflectivity, increasing lifespan and reducing installation costs. Today, road markings are used to convey a range of information to the driver that spans information, on navigation, safety and enforcement issues leading to their use in understanding the road environment within advanced driver assistance systems and attention to future use in autonomous road vehicles. [3] Mechanical tags Cat eye, showing the iron base, rubber casing and lenses Raised-profile tag machine White raised pavement marker near pes structure Sideline on road surface Mechanical devices can be raised or sunk into the road surface, and either reflecting or non-reflective. Most are permanent; Some Movable. Cat's eye, invented by Percy Shaw in the 1930s, Cat's eyes rest many important routes in the British Isles. They consist of four reflective lenses mounted in a durable white rubber casing, two facing forward and two facing backwards. The casing is mounted in a cast iron shoe, which sinks the rubber casing in when driven over. This provides protection against snow plows and allows the lenses to be self-cleaning - they pass a rubber rubber when depressed. The lenses are available in different colors, mainly white, yellow/orange, green, red and blue. Botts' dots (low rounded white or yellow dots), named after the California Caltrans engineer Elbert Botts, who invented the epoxy that keeps them glued, are a type of a mechanical non-reflective raised marker. Generally, they are used to highlight the edges of lanes, often in combination with increased reflective markings. [quote needed] Botts' dots are also used across a lane to draw drivers' attention to the road. They are often used in this way to warn drivers of toll gates, school zones or other significant reductions in the speed limit. They are normally only used in warm climates because snow plows usually remove them along with the snow. Rumble strips are often used for the same purpose. A rumble strip can be a series of simple troughs, usually 1 cm (0.4 inches) deep and 10 cm (4 inches) wide, that is ground from the asphalt. Other alternatives, similar to the dots of the Botts, use raised strips, painted or glued to the surface. A specific form of raised strips using thermoplastic hot profile thermoplastic markers. The markings are created by merging thermoplastic to the pavement and alternating to create height and recession patterns. This can be done as reverse profile markers or elevated profile markers. Reverse-profile markers are created by pressing a tooth roll over the markings while they are wet to them corrugated cardboard. Elevated-profile markers are created by extruding extra thickness from thermoplastic at a specific interval to create bumps. [4] Raised-profile markers are once known as convex traffic lines. [5] The use of rumble strips may be about the direction of travel (to warn of dangers ahead) or along the direction of travel (to warn of dangers of not staying within a specific lane). [6] Their main mode of function is to create a strong vibration when driven over that will warn a driver of various upcoming hazards, both through sound and the physical vibrations of the vehicle. Reflective markings are used as lane dividers, to mark the central reservation (median) or to mark exit slip roads. With a raised retro reflective element, they are usually more visible at night and in bad weather than standard marking lines. The color of the markers varies depending on the country of use; highways in the United States often use reflectors manufactured to appear white to allow drivers to go in the right of the trip, and appear red on the rear to warn drivers that they are going against the right direction of travel, creating a danger of a head-on collision. Reflective markers are also referred to as elevated pavement markers, road studs, and sometimes (generic) in the UK and Ireland as cat eye, although this name refers to a particular brand of product. Product. markings can be used for other purposes, such as marking the locations of fire hydrants (blue) or at gates of fenced communities to indicate that emergency vehicles have a code or device to open the gate. [quote needed] In the UK and elsewhere, elevated markings are used to mark pedestrian crossings to help blind people cross streets. In colder climates, reflective markings can be installed underground using an elongated narrow triangle, cut into the road surface with which the device can be installed under the road surface. Newer technology makes it possible to place them above ground with snowplow rails that try to protect the reflective components from the snowplow blade. Confusion with tracks left by roadwork Typical dash marks in the middle of the lane after dowel bar retrofit roadwork[7] Sometimes the result of roadworks can leave visible marks on the pavements. An example is the dowel bar retrofit process to reinforce concrete slabs to extend the life of older concrete sidewalks. The completion of the process leaves a symmetrical pattern of dashes on the roadway, as if there is an associated meaning to the pattern. [8] When there are many of them along the roadway, motorists can interpret the signs as unknown form of mechanical counters or strange road surface markings. [9] When the roads are under construction and the lanes are moved laterally, these signs may disturb temporary lane markings. Since the markings of the dowel bar retrofit are not intended as any form of marking on the road surface, the responsible authorities try to make these marks less visible to motorists. [10] Non-mechanical counters Paint Paint, sometimes with additives such as retroreflective glass beads,[11] is generally used to mark travel lanes. It is also used to mark parking spaces or special places for disabled parking, loading zones or parking spaces with limited time, colors for these applications vary by place. Paint is a cheap marker and has been in widespread use since about the early 1950s. Paint consists of three main components: pigments, resins or binders, and water or solvents. Pigments are finely ground materials that distribute colors or block the surface underneath. They may contain other materials, such as UV stabilizer, and fillers that bring the color pigments to the required level. Resins or binders are the glue of the paint to bind pigment and glass beads together on the road surface. The resins for water-based paints are latex, methylmercury or acrylic resin. The resins for paint based on solvents are flaxseed or soy oils and alkyl resins. The pigments and resins are mixed with water for water-based paint and solvents for solvent-based paint so that they can be applied to the road surface. Solvents used may be toluene, methanol, methylene chloride and acetone. Due to environmental considerations, some jurisdictions may have restrictions on solvent-based paint. [12] Pigment Yellow 10 is a common yellow dye used to mark the road on U.S. highways. [13] The paint is usually applied immediately after the road is paved. The road is often marked by a truck called a stripper. These trucks contain hundreds of liters of paint stored in huge barrels sitting on the bed. The markings are operated manually or automatically by the controller sitting on the bed. Paint is carried out by a series of hoses under air pressure and applied to the lane surface, along with the use of glass beads for retroreflectivity. After application, the paint dries quite quickly. Sometimes the glass beads are mixed with the paint and applied together, which is not a recommended method. The usual method is to use a separate gun to spray the glass beads on the wet paint during application. [12] Painted symbols, such as turn-lane arrows or hov lane counters, are applied manually using stencils. Painted markings usually last 9 to 36 months. [quote needed] There are a number of water-based paints that can be applied to double the level of thickness of typical latex paints. This technique can extend the life of the markings. [14] Stone lane markings in Lisbon, Portugal On roads paved with decors (as in Belgian/Italian or Portuguese styles) or cobblestones, markings can be made with white blocks or stones, such as marble or other light-coloured rocks. This type of marking is lengthy, but can be slippery in rain or wet conditions unless surfaced with a matte or rough finish. Thermoplastic Main Article: Thermoplastic road marking paint One of the most common types of road marking based on the balance between cost and performance duration, thermoplastic binder systems are generally based on one of three core chemistry: hydrocarbons, rosinesters or Malay modified rosinesters (MMRE). Thermoplastic coatings are generally homogeneous dry mixtures of binder resin, plasticizers, glass beads (or other optics), pigments and fillers[15]. Its use has increased relative to dyeing, mainly due to the performance benefits of increased durability, retro-reflectivity, and a lack of VOC solvents. Thermoplastic markings shall be affixed using specially designed vehicles. Usually, thermoplastic marking mode should apply with equipment called a road marking machine to coat traffic lines, and the road paint must be preheated by a device that a preheater. The thermoplastic mix is heated in trucks to about 200 °C and is fed to the application device. This is often a screed box or ribbon gun. Immediately after the thermoplastic is applied, glass beads are placed on the hot material, so that they embed before the plastic hardens. These beads provide initial initial If the marking wears off during use and the first beads are lost, the beads mixed with the binder are uncovered, which provides long-term retroreflectivity. These can be made exceptionally thick to produce a rumble strip effect. [16] Thermoplastic tag scoring places fast. The melting attachment of a synthetic resin ensures that hot melt paint attaches strongly to the road surface. Additives in the coating paint increases the coating plasticity, improving anti-settling, anti-pollution, anti-encroachment. [clarification needed] Thermoplastic marking paint is usually produced in yellow and white. The white marker paint contains mainly titanium white, zinc oxide, lithopone, while the yellow paint is mainly heat discoloration lead. [clarification needed] In warm climate areas, thermoplastic markers can last three to six years. However, snow plows can damage the thermoplastics, which would limit use in cold climate areas. [14] The filling materials of road paint can affect the mechanical strength, wear resistance and tint of the covering film. The particle size of the paint powder affects the flow, sedimentation and surface processing. Preformed thermoplastic preformed thermoplastic markings that are ready to be applied to the road surface with a flapping torch in Brussels, Belgium Preformed thermoplastic paving marks (once called tape), but not to be confused with preformed polymer tape) are thermoplastic cut into the final shapes by the manufacturers and ready to place on an asphalt or concrete paving surface. Preformed thermoplastics are placed in place on the road surface and applied using a propane heat torch. Some models require heating of the road surface prior to the installation of the preformed thermoplastics. These markings are mainly used because of their durability and cost-effective life span. Since the plastics in the surface are melted, they are not easily damaged by the snow plows. Typically, the preformed thermoplastic markings can last 3 to 6 years. The most common uses of preformed thermoplastic paving markings can be found at intersections as transverse markings such as stop lines, legends, zebra crossings, arrows, bike path symbols, and accessibility symbols. [12] [14] Preformed polymer tape Preformed polymer tape used for cross-lying markings on a New York city street (notice tape failure on leftmost stripe) Commonly referred to as tape or cold plastic, this product is heavy-grade material with reflective pearls embedded in the plastic. It is often used to crosswalks, stop bars traffic guidance, such as exit lanes, HOV lanes, level crossings, pedestrian crossings, taxiways, bus lanes and cycle paths. There are two ways to apply tape: Overlay. The application is laid over the surface of the pavement. Using industrial rubber cement, once the tape is combined with the pavement, the last three important obstacles to estimated life are snow plows, salt and wrong application. Inlay: The tape becomes physically part of the asphalt. Using the heat generated in the paving process, road workers put special tape on the asphalt in the hardening process, and reels compress the two together. The lifespan of the preformed polymer tapes may vary based on the applications. If applied correctly, they can last between 4 and 8 years. [14] However, there have been cases where tire failures begin soon after the installation. Conditions that can help to peel off the tapes are the time of year of installation that is too close to winter, surface preparation, and craftsmanship. A technique that can be used to minimize the tape scraped off by snow plows, sandblasts a groove into the surface and attaches the tape to this groove. This technique reduces the benefit of low labor costs of the tapes. [17] Polymer band preformed markings are smooth when wet, especially in large sections such as zebra crossings, and caution should be used because of poor wet traction. Epoxy Epoxy contains two parts that are a pigmented resin base and catalyst. The two parts are mixed into a specialized truck for epoxy marking application. The epoxy is then heated before being sprayed onto the road surface. Retroreflective glass beads are applied using a separate bead gun behind the epoxy spray gun. Typically, epoxy markings last about 4 years. [14] Epoxy has been in use since the late 1970s and has gained popularity over the 1990s as technology has become more affordable and reliable. This material competes directly with plastic with respect to use and cost. [18] Negative effects on road surface Raveling road surface and potholes found exclusively along pavement markings Non-mechanical markers are found to contribute to the deterioration of the courses of the asphalt concrete road surface. Paint and tire counters can cause the road surface to crack, and in more serious cases, counters contribute to road surface raveling[19] (a process in which aggregate particles are expelled from the road surface, causing the surface texture to become deeply pitted and very rough[20]) or potholes. This type of surface damage can only be found under the pavement markings such as lane markings and turn-lane arrows. There is no definitive explanation for the link between paving markings and surface deterioration, but there are several hypotheses. One is that water vapor may have been trapped under the road surface markings, causing de-binding asphalt from the aggregated materials. Another hypothesis is that the reflectivity of the markings can lead to differences in solar heating and thermal expansion strains between areas with and without markings. Small defects caused by differential strains can be combined in longitudinal cracks along the There are certain surface treatments that can make the road surface less sensitive to this type of emergency, such as slurry seals and stoneastic asphalt. [19] Glass incident light is broken inside glass beads on road surfaces and reflected in the driver's field of view. Glass beads consisting of soda lime glass are essential for providing retroreflectivity in many types of road markings. [21] Retroreflectivity occurs when the incident light of vehicles is broken within glass beads embedded in road markings and then reflected in the driver's field of view. [22] In the United States, the demand for glass beads has led to importing countries using outdated production regulations and techniques. [quote needed] These techniques include the use of heavy metals such as arsenic, antimony and lead during the production process as decolouring and refining agents. It has been found that the heavy metals are incorporated into the glass matrix of the bead and can leach out under environmental conditions that experience roads. [23] Wear can loosen these pearls from road marking themselves, and the reaction of these pearls with a watery environment greatly accelerates their dissolution and heavy metal release. [quote needed] During both routine road marking removal and harsh environmental conditions, these glass beads can degrade and leach contained heavy metals. [quote needed] There are other, non-toxic metals that can achieve the same results. These can include zirconium, tungsten, titanium and barium. [24] The technique of marking thermoplastic off marking point is a solid powder at room temperature. The thermoplastic paint is melted into a specialized machine called a thermoplastic heater mixer, before being transferred into the paint tank of a marker. Larger marking machines can have internal heating mixers. The molten coating is placed in an insulated marker bucket. The marker bucket leads to a marker shoe that applies the material. Sliding the shoe forward attracts a thin coat of paint on the road. The thickness of this layer is controlled by the gap between the marking shoe and the road. A specialized attachment can spread an even layer of glass beads on the paint as it is deposited. Machine marking types Air spray is a marking method that uses compressed air to spray the paint on the road surface. The finely atomized paint produces a thin and smooth layer, but the reflective air flow causes considerable paint scattering. This results in somewhat sloppy markings. High-pressure airless spraying uses a high-pressure airless pump to spray the paint. The atomized paint is not so fine smooth as air spray, but there is no high speed airflow to disperse any rebounding paint. The marked lines are neat. This method can apply paint of high viscosity and apply relatively thick layers in one passage. apy, equipment Other equipment is often used with road marking machines. The main auxiliary equipment includes thermoplastic paint preheaters, hand-push pre-markers and road marking removers. Thermoplastic paint preheater is used to melt the solid powder coating into a viscous liquid, providing a constant supply of paint to the marking machine. Pre-markers are used to draw a field sketch in advance to avoid faulty marking. Road marker removers are used to remove old or incorrect markings. Large self-driving machines don't usually need support equipment because equivalent functionality is built in. Temporary markings Traffic cones are sometimes used to separate high-occupancy lanes from regular lanes. They are also used in areas where lanes are used at different times for travel in both directions. These cones have shafts that fall into holes in the road surface. A good example of this type of use was the Golden Gate Bridge in San Francisco, before switching to a movable barrier system. Removable tapes can also be used in road construction sites as temporary markers. The tapes can be placed to shift the lanes and black tapes can be used to temporarily obscure the existing markings. At the end of the constructions or within 6 months, the tapes can be pulled from the surface without the use of heat, solvents or machinery. [12] Country specific information America Almost all countries in the Americas have solid and intermittent yellow lines separating traffic directions. However, Chile and Argentina have intermittent white lines that separate traffic when overtaking from both directions is allowed, and sturdy yellow lines when overtaking is prohibited from both directions; when overtaking is allowed from only one direction, these countries separate traffic with a combination of white and yellow lines. [quote needed] Canada Yellow lines are used to separate traffic moving in opposite directions, and white lines are used to separate traffic moving in the same direction, and on the shoulders of paved roads. On one-way road a yellow line appears on the left shoulder and a white line on the right shoulder. Passing rules are indicated by dotted lines as in the United States. In Ontario it is legal to cross a single or double solid yellow line along a straight road and the vehicle is not within 30 meters of a bridge or level crossing. [25] Orange painted lines are sometimes used when the direction of the road is temporarily changed for construction projects. The however, it was reversed before 1971, when white was previously used to indicate the separation of opposing traffic, and yellow lines, when used, to indicate the separation of the paved road from the right shoulder. [26] Broken lines that are wider and closer together than regular broken lines are called continuity lines. Continuity lines on the side of a lane indicate that the lane is about to end and that motorists need to merge quickly on the left. Continuity lines on the right mean that the roadway continues, but traffic can move in. [27] In some areas, reflective markers (cat eyes) are sunk into the pavement used, especially approaching curves in the road. A number of counties have paving marking test areas on major roads, to evaluate new paving markings in relation to existing markings. In Ontario, a well-known location is the eastbound lanes of Highway 401 near Belleville. Other test sites are on the westbound lanes on Highway 417, east of Ottawa, Highway 60 West of Renfrew, Highway 28 east of Bancroft, Highway 400 north of Honey Harbour and on Highway 37, south of Tweed. Paving marking manufacturers from around the world supply a variety of materials for these sites to have their products evaluated and approved for use on provincial highways. [28] Other provinces with road marking test areas include Quebec, New Brunswick, and Nova Scotia. Quebec is outside Montreal on Autoroute 40; in New Brunswick, the area is outside Fredericton on Highway 2; Nova Scotia's testing area is north of Halifax on Highway 102. United States Dead Man's Curve along the Marquette-Negaunee Road in Marquette County, Michigan, shown in 1917 with its hand-painted centerline. In the United States, the first documented use of a painted centerline was in 1911 along Tremont's River Road in Wayne County, Michigan. [29] According to the state of Michigan, the idea of using a painted centerline was conceived in 1911 by Edward N. Hines, the president of Wayne County, Michigan, Board of Roads [30] after watching a leaking milk truck leave a white track along a road. [31] Hines was the fifth recipient of the George S. Bartlett Award for Highway Progress,[32] and was posthumously inducted into the Michigan Transportation Hall of Honor in 1972 for his innovation, and was honored in 2011 with the first Paul Mijksenaar Design for Function Award. [31] In 1917, the idea of using painted center lines on rural state highways was conceived and/or put into action in at least three states (Michigan, Oregon, and California), apparently completely independent of each other. [33] At some point in 1917, a white road center line was painted along Dead Man Curve on what is now County Highway 492 492 in Marquette County, Michigan.[31] under the direction of Kenneth Ingalls Sawyer, who served as engineer/superintendent of the Marquette County Highway Commission. [34] [35] [36] Sawyer was posthumously inducted into the Michigan Hall of Honor in 1973. [37] In Oregon in April 1917, a yellow center line was painted down the center of Columbia River Road, between Crown Point and Multnomah Falls, at the direction of Multnomah County Sheriff's Deputy Peter Rexford. [38] Later in 1917, the same line line west of Crown Point. [38] Rexford first came up with the idea of a yellow center line in early 1917 while riding on a bus from Salem, Oregon on a dark and rainy night.[39] and advocated it as a safety measure on Columbia River Road, which Rexford patrolled as a traffic officer. [40] When Multnomah County refused to fund the project, Rexford's boss, Chief Deputy Martin T. Pratt (later elected Sheriff), paid for the paint out of his own pocket so that the center line could be painted. [40] [41] [42] Rexford later described the April 1917 line as the first yellow centerline ever painted on pavement in the United States. [38] An article published in the Oregonian at Rexford's retirement claimed that a \$10,000 reward contest was once held to determine the principal of the road line, but the contest was scrapped when information from Europe revealed that ancient civilizations had used white bricks to mark the center lines of their streets. [39] In the fall of 1917, Dr. June McCarroll of Indio, California developed the idea of white center lines and began advocating for their use after she was driven off the road by a truck while driving along a highway that would later be incorporated into U.S. Route 99. [43] Dr. McCarroll soon communicated her idea to the local chamber of commerce and the Riverside County Board of Supervisors, without success. She then took it upon herself to paint a white stripe in the middle of the road, determining the actual width of the roadway to prevent similar accidents. [44] In 2002, a portion of Interstate 10 was designated and signed as The Physician June McCarroll Memorial Freeway in her honor. [44] The question of what color to use for road center lines (dividing opposite traffic) in the United States was the subject of considerable debate and changing standards over a period of several decades. [45] It was the only most controversial and most heavily discussed issue resolved by the promulgation of the 1948 edition of the Manual on Uniform Traffic Control Devices (MUTCD), which required white as the standard color of middle lines nationwide. [45] The only exceptions to this standard were for dual center lines on multi-lane roads and for centre lines in non-passing zones, where yellow but not mandatory was recommended. [45] By November 1954, 47 of the 48 states had adopted white as their default color for highway center lines, with Oregon being the last holdout to use yellow. [33] In 1958, the U.S. Office of Public Roads approved white as the default color for the new system Good. [46] The 1961 edition of MUTCD required the use of yellow for the two specific exceptions where yellow had previously been recommended but not required, and simultaneously prohibited white in those contexts. [45] The authors of 1961 MUTCD gave three reasons for the change: (1) It contrasts with the white central or lane lines and therefore emphasises the danger; (2) Yellow is accepted as a symbolic warning colour in signs and signals; and (3) It is in accordance with the standard for non-passing zone markings approved by the American Association of State Highway Officials and is in use in more than two thirds of the states for barrier lines. [45] The 1971 edition of MUTCD required yellow as the standard color of all center lines on all roads and roads in all contexts, and forbade the use of white. [45] [47] The point was to establish a consistent color code in pavement markings: from now on, yellow would always delineate opposing traffic flows and white would always delineate traffic flowing in the same direction. [45] The transition to the 1971 MUTCD standards took place between 1971 and 1975, with most of the overpainting completed at the end of 1973, so drivers still had to use the old and the new for two years. One strange exception was that white was still allowed as the left edge line color on the leftmost lane (closest to the median) on divided highways. The 1973 edition of the MUTCD fixed this by obliging yellow for left edge lines on divided highways. [45] The major drawback to the white-yellow MUTCD system is that yellow contrasts slightly less than white, especially at night, so that for maximum contrast, bright yellow and highly toxic-lead chromaat was used to paint yellow lines by the end of the 20th century. As a result, U.S. transportation personnel should take special precautions when disrupting or removing yellow lane markings. [48] In 2002, the Texas A&amp;M Transportation Institute conducted research on the viability of converting yellow to white middle lines for the Transportation Research Board. [49] The researchers conducted a study and found that 75% of American drivers associate yellow middle lines with distributing opposite traffic; this number rises to 85% for fixed middle lines. [49] These findings implied that any conversion to white would require an enormously expensive driver education program on top of the cost of repainting center lines, and therefore Texas researchers recommended against conversion. [49] A typical stretch of Valencia Boulevard in Valencia, California, where lanes are marked only by Botts points. In the U.S., the type, placement, and graphic standards of road signs, and road surfaces are regulated by law-the Federal Highway Administration's Manual on Uniform Traffic Control Devices is the standard, although each state produces its own manual based on the Federal Manual. [50] In some areas, such as Colorado and the black material is applied to the surface before a shorter white line is painted. This improves the contrast of the marking against white sidewalks, such as concrete or faded asphalt. In California, botts' dots were often used to mark lanes on most highways from the mid-1960s to 1960 the mid-2010s (when the state began to transition away from them and back to using painted lines to divide lanes). Many California cities also use botts dots on some (or all) major arterial roads. The notable exception is the city of Los Angeles which uses only paint. [quote needed] In California and Nevada, Botts' dots when present are usually the lines, and no paint is used for additional markings. Exceptions are: highways built of white concrete where painted strips are added to make the lanes more visible through solar glare, highways built so wide that the risk of drifting off the track is minimal (for example, Interstate 5 in the Central Valley), and highways in areas where it snows in winter (because snowplows would scrape out the Botts' dots). In general, one broken lines mean passing or lane changing is allowed, single solid white lines mean changing the lane is discouraged or forbidden, and double solid white lines mean it is forbidden.[51] as it is often in tunnels. On two-lane roads, a single broken centerline means that passing is allowed in both directions, a double solid center line means passing is prohibited in both directions, and the combination of a landline with a broken line means that passing is only allowed from the side with the broken line and prohibited from the side with the landline. [51] The solid white line on the right is called the 'fog line' used to help cars stay in their lane during foggy conditions and help pedestrians stay off the road. Marked crosswalks are minimally indicated by a few white lines. On large boulevards, zebra crossings are further marked by zebra strips, large white rectangles in the crosswalk perpendicular to traffic. To maximize the life of crosswalk stripes, they are usually applied to correspond to the parts of the track on which the wheels of a car usually do not travel, causing the wear of the markings themselves. Paving markings are used in addition to signs in the United States to designate regular and handicap parking spaces. Regular parking spaces are normally marked with white, although other colors are used. Parking spaces with handicaps must be within a certain distance from an entrance. [quote needed] Blue markings are used to indicate that the parking space is reserved for persons with a disabled parking permit. [52] Asia Avenue Hong Kong Road tags in Hong Kong are fundamentally identical to the United Kingdom, with longer interrupted white lines to opposite traffic, and shorter interrupted white lines for lanes in the same direction. Sturdy double white lines are used to indicate that drivers are not allowed to change lanes. A solid white line with a broken white line indicates that crossing the line is allowed from the lane closer to the broken line. Double solid white lines are in place in all and underpasses. As in the UK, fixed yellow lines are painted along the kerb to indicate that no parking is allowed, with double plain yellow lines meaning no parking is allowed at any time. But unlike UK loading and unloading are also prohibited in addition to parking. [53] (Parking itself is prohibited on any street with lampposts with or without the yellow markings on curbs.) [54] Zig-zag lines are used at both ends of crosswalks. Road studs are also used as in the UK. [55] Japan Workers apply crosswalk road surface markings in the Tokyo area. In Japan, white always separates traffic in the same direction or indicates traffic in the same direction can use a buffered area that is striped in crosshatch patterns, such as turning right on two-way roads because Japan is a country that has left driving. White is also used on divided highways with a solid raised middle divider. Two-lane highways where poles are the only physical barrier between opposite directions of travel always have yellow on either side of the row of poles, and white is between the yellow striping and the poles. White is also used to indicate passing allowed on other two-lane roads. Yellow indicates that it must not pass by. On all roads, yellow stripes are always firm. On highways where many sharp bends and bends, especially seen in the largest cities, a yellow line gives no passing between lanes, as follows: Plain yellow next to solid white: no access allowed from the track the stripe is next, but passing is allowed with caution. Solid yellow beside the off-white: passing is permitted from the side with the broken white line, but not from the side with the yellow line. Solid yellow line only: passing prohibited from both lanes, used on very tight bends and in tunnels. Other markings are in the cities, destination and exit names painted in the lanes, which is done due to the very close proximity to exits, where in many cases it would be impractical to put up many overhead signs, although these are often seen approaching exits, a curved or angled arrow pointing to the side of the highway the exit will be on. A straight arrow that follows signs indicates the destination of the highway. When a solid white line between lanes appears, passing is generally allowed, but with caution. Europe In Europe, each country has its own standards. Top - German soil - French style In general, European countries follow the Vienna Convention on Road Signs and Signals, which describes how road signs and road markings should look like The treaty has some flexibility, so that the road markings differ slightly between the countries. Most European countries reserve white for routine lane markings of any kind. Yellow is used to mark prohibited parking, such as at bus stops. However, for example Norway has yellow markings separating traffic directions, directions of traffic, countries use yellow, orange or red to indicate when lanes are temporarily shifted to make room for construction projects. In Croatia, in addition to serving as temporary signage, yellow lines are permanently used to differentiate lanes and differentiate directions dedicated to public transport. In France on motorways, the outside lines are interrupted at a regular distance, allowing drivers and police to check the distance between moving vehicles. In Israel, white lines are used to separate both traffic in the same direction and in the opposite direction, while yellow lines are used to mark the shoulder of the road. In the Netherlands, Germany, Sweden and the United Kingdom, so-called naked roads have been tested, removing all visible road markings, kerbs, traffic lights and signs on urban roads. When this was tested in Seend, a village in the British county of Wiltshire in 2005, the county council reported that accidents fell by a third, with the speed of motorists falling by an average of 5%. It has been suggested that naked roads force drivers to make eye contact with other road users, and that it is this non-verbal communication that is responsible for reducing accidents. [56] Others have suggested that road markings, especially with middle counter, make the road look like a main road, which triggers faster and more relaxed driving, while not marking the road looks like a lower quality road. It is an experience of the introduction of marking, that at least on narrow roads and in bends, middle lines help to keep drivers on their side at the meeting, and thus reducing encountering accidents [needed citation]. Note that the 2005 experiment



was on urban roads. In Sweden, local streets generally don't have a marking[citation needed], Netherlands In the Netherlands, all general lines are white, while yellow lines are used to mark bans (plain yellow), prohibited parking (broken yellow) and for temporarily covering construction projects. Shoulder lines are generally interrupted outside the built-up area to make the driver aware of the presence of crossing bikes and pedestrians, driveways and stopping cars. Wider roads sometimes have a single, but in most cases have a double center line. Intermittent midlines mean that overtaking is allowed, a landline means that overtaking is not allowed, depending on which side of a double line is solid. Smaller roads and roads where bicycles are allowed generally have no middle lines, and many country roads have no lines at all. Sometimes there is a midline only in sharp bends. Shoulder lines on and motorways are solid to imply the general absence of crossing traffic and residential driveways, as well as non-compliance with the road in places other than specified exits. Highways always have double middle lines. The exit and acceleration lanes are separated by 'block marking'. block marker. several road signs have been painted on the road, such as speed limits and warnings. Norway In Norway, yellow lines are used to separate traffic moving in opposite directions and on the left shoulders of paved roads, and white lines are used to separate traffic moving in the same direction, and on the right shoulders of paved roads. On roads narrower than 6 m (20 ft), the midline is removed, and the shoulder lines are broken. Short, broken lines means passing is allowed, long, broken lines means passing is allowed but dangerous, and a double yellow line means passing is prohibited. Roads with speed limits below 60 km/h (37 mph) that indicate that passing is allowed, but dangerously have a very short yellow line rather than a long one. On highways, the left shoulder is a yellow line, as in the U.S. Most other European countries use white lines for all these types of lines. United Kingdom A box junction in London, pictured from across the road from the Monument in 1969 In the UK, the first white line road markings appeared on a number of dangerous bends on the London-Folkestone road in Ashford, Kent, in 1914. In England, the idea of painting a central white line in Sutton Coldfield, Birmingham, was first experimented with in 1921. After complaints from residents about reckless driving and several collisions, the Sutton Coldfield Corporation decided to paint the line at Maney Corner in the Maney area. [57] In 1971, a correspondent for the Coldfield News wrote Sutton an article in the newspaper recalling the event. The line was put down as an experiment as there were many accidents there, even in the early days of the car. The experiment proved so successful that the whole country adopted it as a standard road safety device, and later painted lines on their roads abroad. [quote needed] During World War II, the Pedestrian Association lobbied the government to make it safer for pedestrians to walk during the blackout. As a result, white lines were painted on the sides of the road and pedestrians were allowed to use a small torch. [58] In the UK, the first white line road markings appeared on a number of dangerous bends on the London-Folkestone road in Ashford, Kent, in 1914, and during the 1920s the rise of painted lines on UK roads grew dramatically. [59] In 1926, official guidelines were issued by the Ministry of Transport that determined where and how white lines should be used on roads. A broken white line in the direction of travel, where the holes are longer than the painted lines, indicates the middle of the road and that there are no dangers are for the design and layout of the road, i.e. no bends, sharp bends ahead etc. A broken white line in which the holes are shorter than the painted lines indicates an emerging danger. [60] Road brand in London The department of Transport experimented with double-line road double-line road first on parts of the A20 and A3 during Easter in 1957. [61] The tags were cautionary, and had no legal status at that time, but motorists were advised that ignoring them could weigh heavily against someone involved in an accident in their vicinity. Furthermore, it is in order, if safe to do so, to cross the lines only when the broken one is on your side. It is not to cross when the landline is on your side or to park there. [62] Despite the instruction on parking, it was noted that nine bus stops were located within prohibited parking places. [61] A double solid white line indicates that the line cannot be crossed, overtaking is permitted if it can be carried out safely without crossing the line. Landlines can be exceeded in certain specific circumstances (entering premises, overtaking a stationary vehicle, overtaking a vehicle, pedal cycle or horse traveling at less than 10 mph, or when asked to do so by a police officer). A solid white line with a broken white line parallel to it indicates that crossing the line is allowed for traffic in one direction (the side closest to the broken line) and not the other. Solid white lines are also used to highlight the outer edges of a road. A double yellow line (commonly known as only a Double Yellow) next to the curb means that no parking is allowed at any time, while a single yellow line is used in conjunction with signs indicating that parking is limited at certain times. Double and single red lines mean that stopping at no time or between certain times is allowed. On many roads in the UK, retro-reflective road studs, including those known as cat's eyes when referring to the Halifax type road stud, are placed in the way. These devices reflect the light from a car's headlights back to the driver to highlight road features in poor visibility or at night. The color of the road studs varies depending on their location. Those who determine the distribution between lanes are white, red roads are placed along the hard roadside of highways, dual carriageways and other roads to mark the left edge of a career; and orange wegnops are placed along the edge of the central reservation. Green road studs indicate slip roads at grade-segregated intersections and also road-side lay-bys. Comprehensive information on motorway markings in the UK can be found in the Highway Code and on the gov.uk website. Russia In Russia, yellow lines can be used instead of white lines to separate oncoming traffic flows. They were only briefly, in 2018, and were first painted on a short stretch of national highway A138 in Murmansk Oblast. [63] Broken yellow lines at the edge of the road mean that you can't stop parking, but up to 5 minutes, or more if needed to load and unload people or cargo. A solid yellow line at the edge of the road that stopping is forbidden. During roadworks, temporary orange lines are often provided. These take precedence over permanent markings. Oceania Australia In Australia, white lines are generally used to separate traffic flowing in the same direction and traffic flowing in the opposite direction. Double solid white midlines shall not be exceeded under any circumstances unless an obstruction is avoided. Dotted lines can be crossed for overtaking, changing lanes or turning, and also in the case of double line markings provided that the dotted line is on your side of the markers. For this reason, dotted lines are usually used to mark multiple lanes in one direction. Yellow lines along roadside edges are used nationally to indicate No Standing areas not otherwise marked with signs. Solid white lines are also used to indicate sidewalk parking, pedestrian and bike lanes and other curb side features. Yellow line markings are also used in areas that regularly receive annual snowfall to provide contrast. Double line markings are used to separate traffic flowing in opposite directions on busy roads. Solid white lines are used to mark an intersection where a driver must stop before entering while following all laws of the right to the road. Dotted white lines are used to mark an intersection at which a driver must recede. Dotted white lines are also often used to indicate bends in intersections and to indicate intersections where a diamond twist is possible (intersections in which two cars turn in the opposite direction in the same direction as each other without coming into contact). Materials used are water-based paint, thermoplastics and cold applied plastic (PMMA), all with glass bead. Bead is generally 1mm for longitudinal marking. Currently moving to performance-specific contracts where the primary performance indicator retro-reflectivity is measured with 30 m (98 ft) geometry instruments. Intervention levels generally range from 100 to 150 mcd/lux/m2 (from 0.029 to 0.044 feet-lamberts). In areas with high levels of snow, such as Snowy Mountains NSW (where this picture was taken), yellow lines are used to contrast the white snow. The markings on the side of the road are also larger than other markers in NSW and pink, to increase visibility in snowy weather The bridge over the Thredbo River. One of the points in which the white lines turn yellow as the amount of snowfall increases New Zealand Although New Zealand follows the convention of a firm yellow line to indicate no passing on roads with two-way traffic, it uses 3 m-long (9 ft 10 in) dotted white lines with a 7 m (23 ft) gap indicate when passing against traffic is allowed on two-lane roads and shorter to separate lanes going in the same direction. 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